

## CLAIMS

1. A bioreactor for growing engineered tissue, which bioreactor comprises:
  - a vessel for containing cell-culture media,
  - a pair of approximately parallel, approximately equidistant, surfaces
- 5 which define a gap and provide substrates for cell tissue growth to occur within such gap,
  - means for maintaining conditions within said vessel conducive to cell tissue growth, and
  - means for moving said surfaces relative to one another within media supplied to said vessel so as to subject tissue growing upon and between the surfaces to
- 10 physiological flow and to shear stress.
2. The bioreactor of claim 1 wherein said means for moving in relative motion creates oscillating motion.
3. The bioreactor of claim 2 wherein said surfaces are flat or curved plates that are aligned so as to have facing surfaces that are substantially equidistant from each
- 15 other.
4. The bioreactor of claim 3 wherein said surfaces are parallel plates.
5. The bioreactor of claim 4 wherein one of said plates is gas-permeable.
6. The bioreactor of claim 2 wherein said surfaces have facing coaxial cylindrical surfaces and are capable of growing a cylindrical vascular graft.
- 20 7. A method for growing engineered tissue, which method comprises:
  - providing facing surfaces in a bioreactor vessel,
  - supplying said vessel with cell-culture media under conditions conducive to cell tissue growth, and
  - maintaining relative movement between said facing surfaces so as to
- 25 subject cell tissue growing upon said surfaces to physiological flow and shear stress.

8. The method of claim 7 wherein said relative movement is oscillating motion.

9. The method of claim 8 wherein both said facing surfaces are caused to move in opposite directions to create said oscillating motion.

5 10. The method of claim 8 wherein the period of oscillation of said surfaces is about 20 seconds or less.

11. The method of claim 8 wherein the oscillating motion is carried in a generally horizontal direction.

12. The method of claim 7 wherein said vessel is supplied both with cell  
10 culture media and with scaffolding constituents as a result of which scaffolding and tissue are simultaneously grown between or on said facing surfaces.

13. The method of claim 7 wherein said cell culture media is supplied in a viscous or viscoelastic solvent having a viscosity of at least about 1 centiPoise.

14. The method of claim 7 wherein one of said surfaces is gas-permeable.  
15. The method of claim 8 wherein a shear stress in the range of about 10 to 1000 dynes/cm<sup>2</sup> is applied.

16. The method of claim 15 wherein said tissue growing on said surfaces is subjected to a strain level in excess of 1, with such strain being the ratio of the magnitude of oscillation to the width of the gap between the facing surfaces.

20 17. The method of claim 7 wherein said spacing between said equidistant facing surfaces is between about 1 micrometer and about 5 millimeters.

18. The method of claim 7 wherein conditions are employed so as to grow a multilayered tissue material.